UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
WACO DIVISION

MAXELL, LTD., *Plaintiff,* v. AMPEREX TECHNOLOGY LIMITED, *Defendant.*	Civil Action No.: 6:21-cv-347-ADA JURY TRIAL DEMANDED

DEFENDANT AMPEREX TECHNOLOGY LIMITED'S OPENING CLAIM CONSTRUCTION BRIEF

TABLE OF CONTENTS

Pages

TABLE OF AUTHORITIES

Page(s)

Cases

Statutes

TABLE OF EXHIBITS (attached to Declaration of David S. Bloch)

Exhibit	Title
1	Table of Asserted Patents and Asserted Claims
2	Family Tree of Asserted Patents
3	U.S. Patent No. 8,691,446 ('446 pat.)
4	U.S. Patent No. 9,350,019 ('019 pat.)
5	U.S. Patent No. 9,077,035 ('035 pat.)
6	U.S. Patent No. 9,166,251 ('251 pat.)
7	'446 patent file history: 2012-05-31 final rejection
8	'446 patent file history: 2012-08-24 amendment in response to final rejection
9	'446 patent file history: 2013-08-02 non-final rejection
10	'446 patent file history: 2013-11-01 amendment after non-final rejection
11	'251 patent file history: 2015-02-12 final rejection
12	'251 patent file history: 2015-05012 response after final action
13	Maxell, Ltd.'s Infringement Contentions
14	Declaration of Thomas F. Fuller ("Fuller Dec.")
15	Malvern Instruments Worldwide, "A basic guide to particle characterization"

I. INTRODUCTION

In this case, Maxwell, Ltd. accuses Amperex Technology Limited of infringing 19 claims from 4 patents that relate generally to rechargeable lithium-ion batteries. Three of them—Patent Nos. 8,691,446; 9,350,019; and 9,077,035—focus on the chemical composition of a battery's positive electrode (the "positive electrode family"). The fourth, Patent No. 9,166,251, focuses on separating battery components using heat-resistant elements.

The parties dispute the meaning of 8 terms from the positive electrode family and an additional 2 terms from the '251 patent. Maxell contends that each and every one of these terms can be given its plain and ordinary meaning. Maxell is wrong. As we discuss below, six of the disputed terms suffer from the same fundamental problem: they fail to set forth the metes and bounds of the patent under 35 U.S.C. § 112. The remaining four terms require construction in light of the patents' specifications and file histories.

This is the country's busiest patent court, and does not require a primer on the law governing claim construction. We thus address specific legal issues where they arise rather than in a separate "legal background" section.

II. OVERVIEW OF THE ASSERTED PATENTS

All four asserted patents relate generally to rechargeable lithium-ion ("Li-ion") batteries. Li-ion batteries all include a positive electrode, a negative electrode, a separator, and an electrolyte. Ex. 14 (Fuller Dec.) ¶ 19. The basic structure is depicted in Figure 1, below:

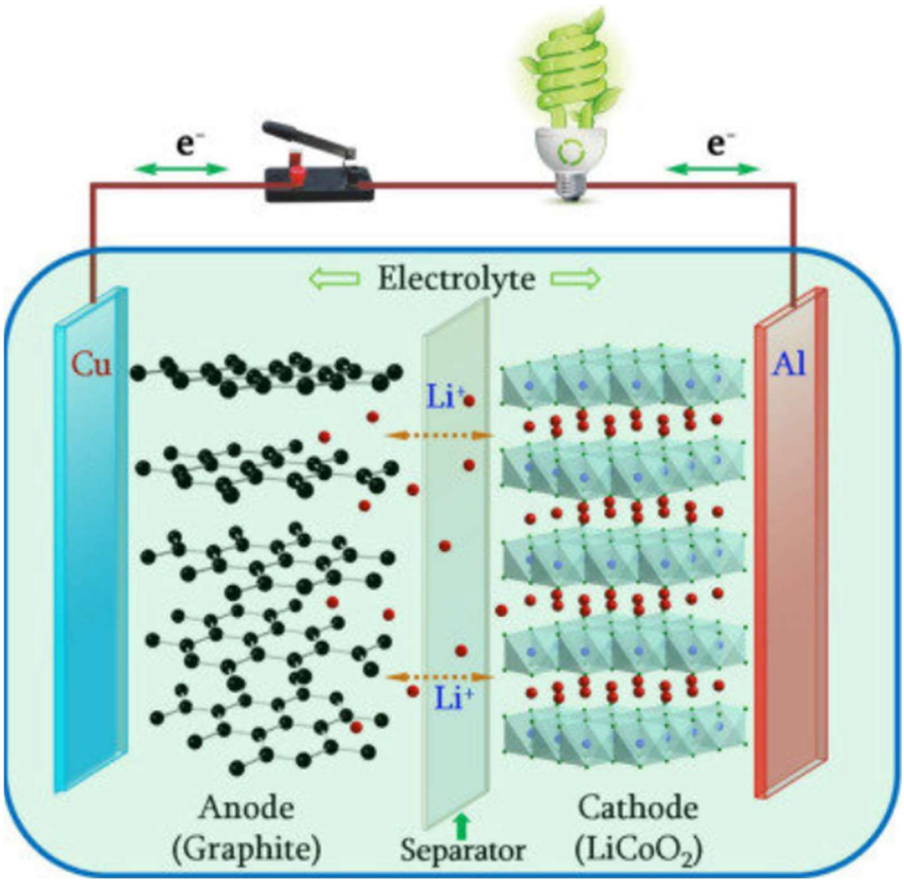

Figure 1: simplified schematic of Li-ion battery. *Id.* ¶ 20.

When the cell or battery is being discharged, lithium ions move from the negative electrode (the anode on discharge) across the separator through the electrolyte and then to positive electrode (the cathode on discharge). *Id.* ¶ 21. When it is being charged, the flow is reversed: lithium ions move from the positive electrode to the negative electrode through the electrolyte. *Id.* ¶ 22. The separator is an inert porous material that allows the free flow of lithium ions between cathode and anode through the electrolyte. *Id.* ¶ 23. If the battery gets too hot, the separator melts, closing its pores and thus blocking the flow of lithium ions. This feature can prevent or at least mitigate "thermal runaway," where the Li-ion battery overheats and—at worst—generate gases that vent and ignite. *Id.* ¶ 24.

A. The Positive Electrode Family: Nonaqueous Secondary Battery and Method of Using the Same

The '446, '035, and '019 patents (all titled "Nonaqueous secondary battery and method of using the same," and reproduced as Exs. 3-5) each describe a Li-ion battery whose positive electrode includes at least two lithium-containing transition metal oxides with different average particle sizes. Like mixing sand with larger pebbles in the same cube, this allows the manufacturer to fit more metal into the same space, leading to more compact and energy-efficient batteries.

The '446 patent (Ex. 3) is the parent of the '019 patent (Ex. 4), while the '035 patent (Ex. 5) is formally distinct but shares many of the same claim terms. In the below chart (Figure 2), common language is in black, language unique to each claim is red, and disputed claim terms are underlined.

'446 patent, Claim 1
1. A nonaqueous secondary battery comprising: a positive electrode having a positive electrode mixture layer, a negative electrode, and a nonaqueous electrolyte, wherein the positive electrode contains, as an active material, at least two lithium-containing transition metal oxides having different average particle sizes, wherein said at least two lithium-containing transition metal oxides having different average particle sizes have different compositions of elements between them, said lithium-containing transition metal oxide having the smallest average particle size is a lithium-containing transition metal oxide represented by the formula (1): $Li_xM^1_yM^2_zM^3_vO_2$ (1) wherein M^1 represents at least one transition metal element selected from Co, Ni and Mn, M^2 represents Mg and at least one metal element selected from the group consisting of Ti, Zr, Ge, Nb, Al and Sn, M^3 represents an element other than Li, M^1 and M^2, and x, y, z and v are numbers satisfying the equations respectively: $0.97 \leq x < 1.02$, $0.8 << 1.02$, $0.002 \leq z \leq 0.05$, and $0 \leq v \leq 0.05$, the positive electrode mixture layer has a density of at least 3.5 g/cm^3, and the nonaqueous electrolyte contains a compound having at least two nitrile groups in the molecule.
'019 patent, Claim 1
1. A nonaqueous secondary battery comprising:

a positive electrode having a positive electrode mixture layer, a negative electrode, and a nonaqueous electrolyte,

wherein the positive electrode contains, as an active material, at least two lithium-containing transition metal oxides having different average particle sizes,

said lithium-containing transition metal oxide having the smallest average particle size is a lithium-containing transition metal oxide represented by the formula (1):

$Li_xM^1_yM^2_zM^3_vO_2$ (1)

wherein M^1 represents at least one transition metal element selected from Co, Ni and Mn, M^2 represents Mg and at least one metal element selected from the group consisting of Ti, Zr, Ge, Nb, Al and Sn, M^3 represents an element other than Li, M^1 and M^2, and x, y, z and v are numbers satisfying the equations respectively: $0.97 \leq x < 1.02$, $0.8 \leq y < 1.02$, $0.002 \leq z \leq 0.05$, and $0 \leq v \leq 0.05$;

a content of Mg in the formula (1) is from 0.15% by mole to less than 2% by mole based on an amount of the metal element M^1;

the positive electrode mixture layer has a density of at least 3.5 g/cm^3; and

the nonaqueous electrode mixture contains a compound having at least two nitrile groups in the molecule.

'035 patent, Claim 1

1. A nonaqueous secondary battery comprising:

a positive electrode having a positive electrode mixture layer, a negative electrode, and a nonaqueous electrolyte,

wherein the positive electrode comprises, as active materials, at least two lithium-containing transition metal oxides having different average particle sizes,

and the lithium-containing transition metal oxide having the smallest average particle size is a lithium-containing transition metal oxide represented by the formula (1):

$Li_xM^1_yM^2_zM^3_vO_2$ (1)

wherein M^1 represents at least one transition metal element selected from Co, Ni and Mn, M^2 represents Mg and at least one metal element selected from the group consisting of Ti, Zr, Ge, Nb, Al and Sn, M^3 represents at least one element selected from the group consisting of Na, K, Rb, Be, Ca, Sr, Ba, Sc, Y, La, Hf, V, Ta, Cr, Mo, W, Tc, Re, Fe, Ru, Rh, Cu, Ag, Au, B, Ca, In, Si, P and Bi, and x, y, z and v are numbers satisfying the equations respectively: $0.97 \leq x < 1.02$, $0.8 \leq y < 1.02$, $0.002 \leq z \leq 0.05$, and $0 \leq v \leq 0.05$, and has an average particle size from 2μm to 10μm, and the lithium-containing transition metal oxide having the largest average particle size is a lithium-containing transition metal oxide represented by the formula (2):

$Li_aM^1_bM^2_cM^3_dO_2$ (2)

wherein M^1, M^2 and M^3 are the same as defined in the formula (1), and a, b, c and d are numbers satisfying the equations respectively: $0.97 \leq a < 1.02$, $0.8 \leq b < 1.02$, $0.002 \leq c \leq 0.02$, and $0 \leq d \leq 0.02$, and has an average particle size from 5μm to 25μm,

wherein said electrolyte contains a fluorine-containing organic solvent, wherein the content of Co in the transition metal M^1 of the formulae (1) and (2) is from 30% by mole to 100% by mole, wherein the content of said lithium-containing transition metal oxide having the smallest average particle size in the lithium-containing transition metal oxides is from 5% by weight to 60% by weight, wherein the content of said lithium-containing transition metal oxide having the largest average particle size in the lithium-containing transition metal oxides is from 40% by weight to 95% by weight, and wherein an amount of said fluorine-containing organic solvent is 0.1% by weight to 30% by weight based on the whole weight of the electrolyte.
Figure 2: first independent claims of positive electrode patent family

As Figure 2 indicates, all three patents claim a high-capacity Li-ion battery where the positive electrode consists of "at least two lithium-containing transition metal oxides having different average particle sizes." Each claim goes on to explain additional characteristics of these lithium-containing transition metal oxides. The '035 patent goes a step further, and also specifies certain details of the Li-ion battery's electrolyte.

But the Devil is in the details, and—as discussed below—the complex formulas recited in these claims are internally inconsistent, thus rendering the patent claims indefinite.

B. The '251 Patent: Battery Separator and Nonaqueous Electrolyte Battery

The '251 patent, titled "battery separator and nonaqueous electrolyte battery" (Ex. 6), does not focus on the positive electrode but instead on the separator. Claim 1 covers (again, with disputed claim language underlined):

'251 patent, Claim 1
1. A battery separator comprising: heat-resistant fine particles; and a thermoplastic resin, wherein the heat-resistant fine particles along with a binder constitute a heat-resistant layer,

> the thermoplastic resin constitutes a shutdown layer formed of a heat-shrinkable microporous film,
>
> the heat-resistant layer and the shutdown layer are integrated into a multilayer structure,
>
> the shutdown layer has a thickness A (μm) of 5 to 30, the heat-resistant layer has a thickness B (μm) of 1 to 10, a sum of A and B is 6 to 23, and a ratio A/B is 1/2 to 4,
>
> a content of the heat-resistant fine particles in the heat-resistant layer is 50 vol % or more of a total volume of components in the heat-resistant layer,
>
> a proportion of particles with a particle size of 0.2 μm or less in the heat-resistant fine particles is 10 vol % or less and a proportion of particles with a particle size of 2 μm or more in the heat-resistant fine particles is 10 vol % or less, and
>
> a shutdown is effected in a range of 135° C. to 150° C.

The problem with these claim terms is simple math and measurement. If thickness A can range as high as 30 μm and thickness B can range as high as 10 μm, then (contrary to the claims) the sum of A and B *can* exceed 23 μm. It makes no sense to say that thickness A can be as high as 30 if the sum of A and B cannot exceed 23—the math simply doesn't work. And the phrase "particle size," without more, is unhelpful considering that the particles are three-dimensional. The asserted claims are invalid.

III. ANALYSIS OF DISPUTED CLAIM TERMS

A. The Positive Electrode Family: Terms Requiring Construction

The parties dispute the construction of eight phrases appearing in the asserted claims of the positive electrode family. We run through them in the order they appear in claim 1 of the '446 patent, and then address terms appearing only in the later patents. The first four terms require the Court's construction; the final four are indefinite and hence render the asserted claims invalid.

1. "positive electrode mixture layer"

Amperex's Proposed Construction	Maxell's Proposed Construction
"A mixture of at least two lithium containing-transition metal oxides formed on one or both sides of an electrode current collector"	Plain and ordinary meaning

The phrase "positive electrode mixture layer" appears in '446 patent claim 1, '019 patent claim 1, and '035 patent claim 1—all reproduced above in Figure 2. It also appears in '446 patent claim 3, as follows (again will all disputed claim language underlined):

'446 patent, Claim 3

3. A nonaqueous secondary battery comprising:

a positive electrode having a positive electrode mixture layer, a negative electrode, and a nonaqueous electrolyte,

wherein the positive electrode contains, as an active material, at least two lithium-containing transition metal oxides having different average particle sizes,

wherein said at least two lithium-containing transition metal oxides having different average particle sizes have different compositions of elements between them,

the positive electrode mixture layer has a density of at least 3.5 g/cm^3,

a lithium-containing transition metal oxide other than a lithium-containing transition metal oxide having the smallest average particle size is a lithium-containing transition metal oxide represented by the formula (2):

$$Li_aM^1{}_bM^2{}_cM^3{}_dO_2 \qquad (2)$$

wherein M^1 represents at least one transition metal element selected from Co, Ni and Mn, M^2 represents Mg and at least one metal element selected from the group consisting of Ti, Zr, Ge, Nb, Al and Sn, M^3 represents an element other than Li, M^1 and M^2, and a, b, c and d are numbers satisfying the equations respectively: $0.97 \leqq a < 1.02$, $0.8 \leqq b < 1.02$, $0 \leqq c \leqq 0.02$, and $0 \leqq d \leqq 0.02$, and,

the nonaqueous electrolyte contains a compound having at least two nitrile groups in the molecule.

Maxell contends that the phrase should be given its plain and ordinary meaning. But "positive electrode mixture layer" doesn't *have* a plain and ordinary meaning to a person of ordinary skill in the art. Fuller Dec. ¶ 25. Rather, the phrase is specific to the positive electrode patent family. And the specifications of those patents make it clear that the positive electrode mixture layer is (a) a mixture (b) of at least two lithium-containing transitional metal oxides that is (c) "formed on one or both sides of an electrode collector" and therefore does not include the collector itself. Maxell contends instead that the *entire* positive electrode is the "mixture layer,"

Exhibit 13 (infringement contentions) at ex. A p. 3, but the specifications make clear that Maxell is wrong.

The '446, '019, and '035 patent specifications each explain that, in making the "positive electrode of the present invention," two lithium-containing transition metal oxides are blended together in a particular weight ratio and applied to the current collector for the positive electrode:

> When the positive electrode active material comprises two or more lithium-containing transition metal oxides having the different average particle sizes, for example, the positive electrode active materials (A) and (B), they are mixed at a predetermined ratio, and then the electric conductive aid and the binder are added to the mixture to prepare a positive

'446 pat. 16:62-17:1; '019 pat. 16:54-17:9; '035 pat. 11:65-12:3. The specifications each describe the structure of the positive electrode, with its blend of transition metal oxides, as "essential" to the invention. '446 pat. 17:45-47; '019 pat. 17:53–55; '035 pat. 13:20-22.

This mixture must include at least two different lithium-containing transition metal oxides:

> The positive electrode active materials according to the present invention may contain only two lithium-containing transition metal oxides having different average particle sizes, for example, the positive electrode active materials (A) and (B) as described above, while the positive electrode active materials may contain three or more, for example, three, four or five lithium-containing transition metal oxides having different average particle sizes, for example, the positive electrode active materials (A) and (B) and one or more lithium containing transition metal oxides having an average particle size between those of the positive electrode active materials (A) and (B).

'446 pat. 9:51-62; '019 pat. 9:59-10:3; '035 pat. 4:66-5:1-10.

Lastly, the specifications make it clear that "the positive electrode mixture layer ... is formed on one or both of the surfaces of an electrode collector" ('446 pat. 7:53-57; '019 pat. 7:61-65) and is "uniformly applied to both surfaces" of the collector ('035 pat. 22:9-13). They contain various examples by which the "present invention" is "described in detail." '446 pat. 22:30-27:23; '019 pat. 22:39-27:29; '035 pat. 21:34-26:49. "When the specification describes the

features of the 'present invention' as a whole, this description limits the scope of the invention." *Lemoine v. Mossberg Corp.*, 2021 U.S. App. LEXIS 27807, at *6 (Fed. Cir. Sep. 15, 2021); *Rembrandt Techs, LP v. Cablevision Sys. Corp. (In re Rembrandt Techs, LP, Patent Litig.)*, 496 F.App'x 36, 45 (Fed. Cir. 2012) ("when the preferred embodiment is described in the specification as the invention itself, the claims are not necessarily entitled to a scope broader than that embodiment"). And each example describes the "positive electrode mixture layer" as including two or more transition metal oxides blended together and applied to both surfaces of the electrode collector. '035 pat. 22:7-12; '446 pat. 23:5-8; '019 pat. 23:14-17. They then go on to describe how to determine the thickness of the positive electrode mixture layers by *subtracting* the thickness of the current collector from the total thickness of the positive electrode to obtain the thickness of the positive electrode mixture layers. '446 pat. 23:16-21; '019 pat. 23:25-30; '035 pat. 22:20-25. Given that the positive electrode mixture layer is formed *on the surfaces of* the current collector of the positive electrode, the positive electrode mixture layer cannot be *part of* the electrode current collector. Fuller Dec. ¶¶ 26-27. Accordingly, the Court should construe "positive electrode mixture layer" to mean "*a mixture of at least two lithium-containing transition metal oxides formed on one or both sides of an electrode current collector*." *Id*. ¶ 28.

2. "the positive electrode contains, as [an] active material[s], at least two lithium-containing transition metal oxides having different average particle sizes"

Amperex's Proposed Construction	Maxell's Proposed Construction
"The active material of the positive electrode is a mixture formed from two or more lithium-containing transition metal oxides, at least two of the transition metal oxides having different average particle sizes"	Plain and ordinary meaning

This phrase appears in claim 1 of each of the positive electrode family of patents. Maxell proposes that it be given its plain and ordinary meaning. Amperex largely agrees, but with an

important caveat: the positive electrode is *formed from* at least two lithium-containing transition metals with different average particle sizes. Fuller Dec. ¶¶ 29-30. As the Federal Circuit has repeatedly held, "a word describing patented technology takes its definition from the context in which it was used by the inventor" and that a patent owner is "not entitled to a claim construction divorced from the context of the written description." *Tap Pharm. Prods., Inc. v. Owl Pharm., L.L.C.*, 419 F.3d 1346, 1354 (Fed. Cir. 2005); *accord Nystrom v. Trex Co.*, 424 F.3d 1136, 1144-45 (Fed. Cir. 2005). In these patents, the claimed positive electrode is described in only one way:

> The positive electrode used in the present invention is *formed by*, for example, a method described below. Firstly, if necessary, an electric conductive aid (e.g., graphite, carbon black, acetylene black, etc.) is added to the lithium-containing transition metal oxide used as a positive electrode active material. Furthermore, to the mixture, a binder (e.g., polyvinylidene fluoride, poly tetrafluoroethylene, etc.) is added to prepare a positive electrode mixture. A solvent is used to formulate this positive electrode mixture in the form of a paste. The binder may be mixed with the positive electrode active material and the like after the binder is dissolved in a solvent. In this way, the paste containing the positive electrode mixture is prepared. The resultant paste is applied to a positive electrode current collector made of an aluminum foil or the like, and then dried to form a positive electrode mixture layer. ... When the positive electrode active material comprises two or more lithium-containing transition metal oxides having the different average particle sizes, for example, the positive electrode active materials (A) and (B), they are *mixed* at a predetermined ratio ....

'446 pat. 16:46-66 (emphasis added); '019 pat. 16:54-17:7 (same). Similarly:

> The positive electrode used in the present invention is *formed by*, for example, a method described below. Firstly, the two or more lithium-containing transition metal oxides having different average particle sizes, for example, the positive electrode active materials (A) and (B), are *mixed* with each other at a predetermined weight ratio. If necessary, an electric conductive aid (e.g., graphite, carbon black, acetylene black, etc.) is added to the mixture. Furthermore, to the mixture, a binder (e.g., polyvinylidene fluoride, poly tetrafluoroethylene, etc.) is added to prepare a positive electrode mixture. A solvent is used to formulate this positive electrode mixture in the form of a paste. The binder may be mixed with the positive electrode active material and the like after the binder is dissolved in a solvent. In this way, the paste containing the positive electrode mixture is prepared. The resultant paste is applied to a positive electrode current collector made of an aluminum foil or the like, and then dried to form a positive electrode mixture layer.

'035 pat. 11:65-12:15 (emphasis added). The patents each describe the formation of the positive electrode by a specific mixture as "essential": "it is essential for the nonaqueous secondary battery of the present invention to have the positive electrode explained above" ('035 pat. 13:20-23); "[i]t is essential for the nonaqueous secondary battery of the present invention to have the … positive electrode" explained above ('446 pat. 17:45-47; '019 pat. 17:53-55). When a patentee describes a limitation as "essential," a proper construction should include that limitation as part of the claims. *Sunrace Roots Enter. Co., Ltd. v. SRAM Corp.*, 336 F.3d 1298, 1305 (Fed. Cir. 2003) ("claim language" must be "limited based on a feature that was described as essential to the invention"). Where—as here—the specification identifies an essential claim feature, and where the embodiments uniformly disclose that feature, the cited feature limits the claims. *ATD Corp. v. Lydall, Inc.*, 159 F.3d 534, 542 (Fed. Cir. 1998); *Gentry Gallery, Inc. v. The Berkline Corp.*, 134 F.3d 1473, 1478-80 (Fed. Cir. 1998). The Court should state that the active material in the positive electrode is a mixture *formed from* at least two lithium-containing transition metals with different average particle sizes. Fuller Dec. ¶ 30.

3. "different compositions of elements" / "is different from"

Amperex's Proposed Construction	Maxell's Proposed Construction
"The first and second lithium-containing transition metal oxides do not share all of the same chemical elements"	Plain and ordinary meaning

The idea that the two lithium-containing transition metal oxides envisioned in the positive electrode patent family are supposed to be different from one another appears in '446 patent claims 1-3 and '019 patents claim 3-4. Each of these claims identifies a particular chemical formula for two separate lithium-containing transition metal oxides. But because the chemical formulas cover ranges, it is possible to construct situations in which both lithium-containing transition metal

oxides are the same. That outcome, however, is foreclosed by the "different from" and "different compositions of elements" language in the asserted claims. Claims 1 and 3 of the '446 patent are reproduced above. '446 patent claim 2 states:

'446 patent, Claim 2

2. The nonaqueous secondary battery according to claim 1,

a positive electrode having a positive electrode mixture layer, a negative electrode, and a nonaqueous electrolyte,

wherein a lithium-containing transition metal oxide other than the lithium-containing transition metal oxide having the smallest average particle size is a lithium-containing transition metal oxide represented by the formula (2):

$$Li_aM^1{}_bM^2{}_cM^3{}_dO_2 \qquad (2)$$

wherein M^1 represents at least one transition metal element selected from Co, Ni and Mn, M^2 represents at least one metal element selected from the group consisting of Mg, Ti, Zr, Ge, Nb, Al and Sn, M^3 represents an element other than Li, M^1 and M^2, and a, b, c and d are numbers satisfying the equations respectively: $0.97 \leqq a < 1.02$, $0.8 \leqq b < 1.02$, $0 \leqq c \leqq 0.02$, and $0 \leqq d \leqq 0.02$, and

wherein a composition of elements of the lithium-containing transition metal oxide represented by the formula (2) is different from that of the lithium-containing transition metal oxide represented by the formula (1).

Claims 3 and 4 of the '019 patent make the same point:

'019 patent, Claim 3

3. The nonaqueous secondary battery according to claim 1, wherein said at least two lithium-containing transition metal oxides having different average particle sizes have different compositions of elements between them.

'019 patent, Claim 4

4. The nonaqueous secondary battery according to claim 2, wherein a composition of elements of the lithium-containing transition metal oxide represented by the formula (2) is different from that of the lithium-containing transition metal oxide represented by the formula (1).

Maxell proposes that these phrases—"different compositions of elements" and "is different from"—be given their plain and ordinary meanings. But Maxell's version of "different" could in

principle capture *chemically identical* lithium-containing transition metal oxides. Fuller Dec. ¶ 31. This is an important practical distinction, in that the accused Amperex products only use one lithium-containing transition metal oxide—they practice the prior art. The Court thus must rule on what "different" means in the context of the asserted '446 and '019 patent claims. *See generally Eon Corp. IP Holdings LLC v. Silver Spring Networks*, 815 F.3d 1314, 1320 (Fed. Cir. 2016) (plain and ordinary meaning "may be inadequate ... when reliance on the term's ordinary meaning does not resolve the parties' dispute").

The shared specification of the '446 and '019 patents includes multiple examples of Li-ion batteries. But the term "composition of elements" is used only once, to describe the only two alternate embodiments for the claimed lithium-containing transition metal oxides. In one embodiment, the lithium-containing transition metal oxides may have the "same composition of elements" while in the other embodiment the metal oxides may have "different compositions of elements between them." '446 pat. 15:6-10; '019 pat. 15:14-18. The specification's examples illustrate exactly what it means to have a "different compositions of elements." For example,

> [w]hen the lithium-containing transition metal oxides according to the present invention are the above-mentioned positive electrode active materials (A) and (B), the following combination may be used: a combination of the positive electrode active material (A) consisting of $LiCo_{0.998}Mg_{0.0008}Ti_{0.0004}Al_{0.0008}O_2$, and the positive electrode active material (B) consisting of $LiCo_{0.334}Ni_{0.33}Mn_{0.33}Mg_{0.0024}Ti_{0.0012}Al_{0.0024}O_2$.

'446 pat. 15:7-17; '019 pat. 15:15-25. In this sequence, lithium-containing transition metal oxide (A) contains copper, magnesium, titanium, aluminum, and oxygen, while lithium-containing transition metal oxide (B) contains nickel and manganese, in addition to the elements in (A). Example 12 reverses the two—(A) contains the nickel and manganese missing from (B). '446 pat. 27:11-23; '019 pat. 27:16-29.

To be sure, several of the examples in the specification describe lithium-containing positive

electrode materials with the same composition but different molecular weights. *E.g.*, '446 pat. 25:56-63; '019 pat. 25:64-26:3; '035 pat. 25:13-22 (example 6, showing different average particle sizes of 12 μm and 5 μm). But that is the *difference* between claims calling for the lithium-containing transition metal oxides the "same composition of elements" and claims where the metal oxides have "different compositions of elements between them." '446 pat. 15:6-10; '019 pat. 15:14-18. Examples 9 and 12 illustrate the "different composition of elements" embodiment, whereas the remaining examples illustrate the "same composition of elements" embodiment. Specifically, example 9 depicts metal oxide A as containing LiCo and metal oxide B as containing LiCu, while Example 12 depicts metal oxide A as containing LiCu versus metal oxide B containing LiCo plus Ni and Mn. '446 pat. 26:30-44, 27:11-23; '019 pat. 26:37-51, 27:16-29. Examples 1-8 and 10-11 all describe metal oxides containing the same chemical elements with varying molar contents.

"[W]here the patent describes multiple embodiments, every claim does not need to cover every embodiment." *Pacing Techs., LLC v. Garmin Int'l, Inc.*, 778 F.3d 1021, 1026 (Fed. Cir. 2015). But the *asserted* claims—the only claims that should draw the Court's attention—require two or more "different" lithium-containing transition metal oxides.

This interpretation is supported by the file history of the parent '446 patent. As originally submitted, the claims of the '446 patent contained a formula with either "at least one" (claim 1) or "at least two" (claim 5) metal oxides in the positive electrode. During prosecution, however, Maxell's inventors had to overcome a prior art reference, Kikuchi, depicting a lithium-containing transition metal oxides. Exhibit 7 (final rejection) at 2-3, 15 ("it would have been obvious to one of ordinary skill in the art that Kikuchi discloses multiple lithium transition metal oxide compounds with different particle sizes"). So Maxell amended claim 1 to call for at least two

different lithium-containing transition metal oxides having different average particle sizes [with] different compositions of elements between them." Exhibit 8 (amendment in response to final rejection) at 2, 4, 5, 6. It explained to the Examiner that, unlike in the claimed invention, the particles in the anode of Kikuchi "are made of the same material and should have the same composition of elements." *Id*. at 13.

The claims of the '446 and '019 patents were allowed over the prior art only because they claim two chemically different lithium-containing transition metal oxides. So the Court should construe the phrases "different composition of elements" and "is different from" to mean that the first and second lithium-containing transition metal oxides claimed in the patents *do not share all of the same chemical elements.* Fuller Dec. ¶ 32. The fact that there are examples in the specification that seem to share the same chemical elements is of no moment—the claims are what matter, and disclosures not captured by the claims are deemed dedicated to the public. *Johnson & Johnston Assocs. v. R.E. Serv. Co.*, 285 F.3d 1046, 1054 (Fed. Cir. 2002) ("When a patent drafter discloses but declines to claim subject matter ... this action dedicates that unclaimed subject matter to the public"); *Unique Concepts v. Brown*, 939 F.2d 1558, 1562-63 (Fed. Cir. 1991) ("It is also well-established that subject matter disclosed but not claimed in a patent application is dedicated to the public").

4. "a compound having at least two nitrile groups"

Amperex's Proposed Construction	Maxell's Proposed Construction
"A nitrile compound that is 1% or less by total weight of the electrolyte"	Plain and ordinary meaning

The phrase "a compound having at least two nitrile groups in the molecule" characterizes the electrolyte in the claimed inventions. It appears in claims 1 and 3 of the '446 patent and claim 1 of the '019 patent, all reproduced above. Maxell once again proposes that this phrase be given

its plain and ordinary meaning. But that would broaden the phrase well beyond the patents' disclosures. According to the '466 patent specification, "the nonaqueous electrolyte used in the nonaqueous secondary battery of the present invention contains a compound having at least two nitrile groups in the molecule." '446 pat. 3:11-26; *see also* '019 pat. 3:24-35. The only disclosed embodiment, however, contains a much more limited range:

> The amount of the nitrile compound is preferably at least 0.005% by weight, more preferably at least 0.01% by weight, still more preferably at least 0.05% by weight, based on the whole weight of the nonaqueous electrolyte, from the viewpoint of effectively utilizing the effects of the addition of the nitrile compound.

'446 pat. 5:8-20; '019 pat. 5:17-29. This range is not arbitrary. The specification goes on to explain that,

> when the amount of the nitrile compound in the electrolyte is too large, the charge-discharge cycle characteristics of the battery tends to decrease although the storage characteristics of the battery is improved. Thus, the amount of the nitrile compound is preferably 1% or less, more preferably 0.75% by weight or less, still more preferably 0.5% by weight or less, based on the whole weight of the nonaqueous electrolyte.

'446 pat. 5:13-20; '019 pat. 5:22-29.

This is all the patents ever say about the composition of the nitrile compound. And to adopt Maxell's "plain and ordinary meaning" construction would contradict the patents' teachings—there is nothing in the plain meaning of "a compound having two nitrile groups" that would tell a person of ordinary skill the amount of the nitrile compounds. For that, a person of skill would look to the specification—and the specification teaches unambiguously that that the nitrile compound be 1% or less by weight of the electrolyte solution. Otherwise, as the specification explains, the charge-discharge cycle characteristics of the battery will be degraded. The Court thus should construe the phrase "a compound having two nitrile groups"—which, by the plain language of the claims, *must* be present—to be limited to *nitrile compounds that are 1% or less by*

total weight of the electrolyte. Fuller Dec. ¶¶ 33-35.

B. The Positive Electrode Family: Indefinite Terms

The final four disputed phrases in the positive electrode family cannot be construed because as written they are internally contradictory. In such circumstances, the claims must be rejected outright as indefinite. *Nautilus, Inc. v. Biosig Instruments, Inc.*, 134 S.Ct. 2120, 2124 (2014) (a patent is indefinite if its language, read in light of the specification and prosecution history, "fail[s] to inform, with reasonable certainty, those skilled in the art about the scope of the invention").

1. "0.97 ≤x<1.02, 0.8≤y<1.02, 0.002≤z≤0.05, and 0≤v≤0.05" / "0.97≤a<1.02, 0.8≤b<1.02, 0≤c≤0.02, and 0≤d≤0.02"

Amperex's Proposed Construction	Maxell's Proposed Construction
Indefinite	Plain and ordinary meaning

As discussed above, the positive electrode family of patents all describe lithium-containing transition metal oxides composed of varying percentages of lithium and other metals according to set formulas or ranges. The ratios of these different metals is shown in subscript letters that are explained in the claims themselves. Maxell says that these ratios should be given their plain and ordinary meanings. We agree. And if they are given their plain and ordinary meanings, all of the claims that include these figures—indeed, all of the claims of the positive electrode patent family—are indefinite under 35 U.S.C. § 112.[1]

These ratios appear in '446 patent claims 1-4, '019 patent claims 1-2, and '035 patent claim 1. '446 patent claims 1-3, '019 patent claim 1, and '035 patent claim are quoted above or in Figure 2. Claim 4 of the '446 patent reads:

[1] We note here for the record that, as phrased, it is not clear *when* these measurements are supposed to take place. A Li-ion battery is a dynamic system in which the ratio of lithium ions to other transition metal oxides necessarily change in operation. So identifying the few moments (if any) when the proportion of lithium is 0.97 ≤x<1.02 would be an intractable problem for Maxell when it comes time to show infringement. But the Court need never reach that issue, because the relevant claims are indefinite.

'446 patent, Claim 4

4. The nonaqueous secondary battery according to claim 3,

wherein a lithium-containing transition metal oxide having the smallest average particle size among said at least two lithium-containing transition metal oxides is a lithium-containing transition metal oxide represented by the formula (1):

$$Li_xM^1{}_yM^2{}_zM^3{}_vO_2 \qquad (1)$$

wherein M^1 represents at least one transition metal element selected from Co, Ni and Mn, M^2 represents at least one metal element selected from the group consisting of Mg, Ti, Zr, Ge, Nb, Al and Sn, M^3 represents an element other than Li, M^1 and M^2, and x, y, z and v are numbers satisfying the equations respectively: $0.97 \leqq x < 1.02$, $0.8 \leqq y < 1.02$, $0.002 \leqq z \leqq 0.05$, and $0 \leqq v \leqq 0.05$.

Similarly, '019 patent claim 2 reads:

'019 patent, Claim 2

2. The nonaqueous secondary battery according to claim 1,

wherein a lithium-containing transition metal oxide other than the lithium-containing transition metal oxide having the smallest average particle size is a lithium-containing transition metal oxide represented by the formula (2):

$$Li_aM^4{}_bM^5{}_cM^6{}_dO_2 \qquad (2)$$

wherein M^4 represents at least one transition metal element selected from Co, Ni and Mn, M^5 represents at least one metal element selected from the group consisting of Mg, Ti, Zr, Ge, Nb, Al and Sn, M^6 represents an element other than Li, M^4 and M^5, and a, b, c and d are numbers satisfying the equations respectively: $0.97 \leqq a < 1.02$, $0.8 \leqq b < 1.02$, $0 \leqq c \leqq 0.02$, and $0 \leqq d \leqq 0.02$.

In each of the claims where these equations appear, the patent envisions positive electrodes composed of at least two lithium-containing transition metal oxides with different ratios of metals M1, M2, and M3. The form of the first lithium-containing transition metal oxide is shown in formula (1):

$$Li_xM^1{}_yM^2{}_zM^3{}_vO_2$$

The fractional ratios of metals Li (lithium), M1, M2, and M3 are designated as *x*, *y*, *z*, and *v*, respectively, and the claims set forth ranges for each:

$0.97 \leq x < 1.02$, $0.8 \leq y < 1.02$, $0.002 \leq z \leq 0.05$, and $0 \leq v \leq 0.05$.

Formula (2) follows the same format. The lithium-containing transition metal oxide takes the general form of:

$$Li_aM^1{}_bM^2{}_cM^3{}_dO_2$$

Where the fractional ratios of lithium, M^1, M^2, and M^3 are designated as *a*, *b*, *c*, and *d*, respectively, with the following ranges:

$0.97 \leq a < 1.02$, $0.8 \leq b < 1.02$, $0 \leq c \leq 0.02$, and $0 \leq d \leq 0.02$

Formula (2) in claim 1 of the '019 patent is slightly different in that it selects different metals (M^4, M^5, and M^6), which differ from the transition metals in Formula (1). But the ratios for *a*, *b*, *c*, and *d* are the same.

Each of these ranges include an elementary but fatal flaw, namely, that their number of significant figures do not agree. A person of ordinary skill will understand that the fractional range of lithium in *x* or *a* can vary within a range of 0.05, from 0.97 to 1.02. But the POSITA cannot make that same determination with respect to the ratio of M^1, M^2, or M^3. the upper and lower bounds in the ranges $0.8 \leq y < 1.02$, $0.002 \leq z \leq 0.05$, $0 \leq v \leq 0.05$, $0.8 \leq b < 1.02$, $0 \leq c \leq 0.02$, and $0 \leq d \leq 0.02$ do not have the same number of significant digits. Fuller Dec. ¶ 38. Looking at ranges *y* and *b*, the lower bound of M^1 is 0.8 while its upper bound is 1.02. The number of significant digits at the lower boundary (one) corresponds to a measurement with precision in tenths while the upper bound (three significant figures) corresponds to hundredths. *Id.* ¶ 39. A person of ordinary skill knows that these ratios are important and at least some of them are rendered in the hundredths. *Id.* ¶¶ 38, 40. But he cannot determine whether (for example) the lower bound of M^1 in the lithium formation may be 0.75 (attributing precision of one significant figure to the number) or 0.804 (attributing two significant figures). *Id.* ¶ 41. Considering that the range of lithium is confined to

a narrow band of 0.05, this difference is quite significant and leaves the POSITA without clear guidance on how much of the other transition metal oxides are contemplated by the invention without undue experimentation. *Id*. ¶ 42. As Dr. Fuller explains (*id*. ¶43), the absence of a clear range set forth with mathematical precision does not provide the POSITA with "clear notice of what is claimed," and therefore does not "apprise the public of what is still open to them." *Nautilus*, 134 S.Ct. at 2128–29; *see also Astrazeneca AB v. Mylan Pharma. Inc.*, 2021 WL 5816742, at *3 (Fed. Cir. Dec. 8, 2021) (emphasizing importance of mathematical precision, and construing percentages to five decimals).

For M^2, the problem is even more acute: in `446 patent claim 2 and `019 patent claim 2, the ratio of M^2 in Formula (1) ranges from thousandths to hundredths ($0.002 \leq z \leq 0.05$), while in Formula (2) the ratio ranges from whole numbers to hundredths ($0 \leq c \leq 0.02$) *and includes zero*—meaning that M^2 need not be present in the second lithium-containing transition metal oxide at all, despite the claims elsewhere requiring M^2 as part of the metal oxide. M^3 suffers the same fatal flaw: its values range between a whole number and value in the hundredths ($0 \leq v \leq 0.05$ and $0 \leq d \leq 0.02$), and could be zero in both Formula (1) *and* Formula (2). Fuller Dec. ¶ 44.

The claims of the patents themselves require the presence of these additional metals. For example, claim 1 of the '446 patent *requires* a lithium-containing transition metal oxide with the formula $Li_xM^1_yM^2_zM^3_vO_2$ (1), where "M^3 represents an element other than Li, M^1 and M^2." Yet the sentence goes on to say that the amount of M^3, as designated by variable *v*, can equal zero. If so, then M^3 can be read out of Formula (1) entirely. But nothing in the patent or the file history contemplates that M^3 is optional. *See Application of Mayhew*, 527 F.2d 1229, 1233 (C.C.P.A. 1976) ("Although appellant now strenuously argues that the cooling back is optional, his specification not only fails to support this contention, but leads us, as it did the examiner and board,

to believe that both it and its location are essential"); Lockwood v. Ameican Airlines, Inc., 107 F.3d 1565, 1572 (Fed. Cir. 1997) (the claim must "describ[e] the invention, *with all its claimed limitations*") (emphasis added); *Nautilus*, 134 S.Ct. at 2124 (invalidating patent claims that "fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention"). Focusing on the `446 and `019 patents, if all of the ratios for M^2 and M^3 that can be set to zero *are* set to zero, the claimed equations become:

$$Li_xM^1{}_yM^2{}_zO_2$$

and

$$Li_aM^1{}_bO_2$$

But this is not what the patents teach and cuts directly against the plain language of the claims, which call for M^2 and M^3 to be selected from specific lists of metals. An internally contradictory claim is indefinite *per se*. "[C]laims that [are] internally contradictory [are] invalid as indefinite." *Multilayer Stretch Cling Film Holdings, Inc. v. Berry Plastics Corp.*, 831 F.3d 1350, 1362 (Fed. Cir. 2016); *Competitive Techs., Inc. v. Fujitsu Ltd.*, 185 F. App'x 958, 965-66 (Fed. Cir. 2006) ("Because the 'address means' limitation of claim 5 requires ISA structures, and the 'sustain means' limitation of that same claim excludes ISA structures, a person of ordinary skill in the art would be unable to determine the scope of the claims. They are internally inconsistent. We therefore conclude that the court did not err in holding that claims 5-11 are invalid because of indefiniteness").

Therefore, all asserted claims in which the ranges of transition metals are either stated at different levels of precision or that eliminate key claim terms by setting their relative proportions to zero must be held invalid as indefinite. Fuller Dec. ¶¶ 43-44; *see*, *e.g.*, *Multilayer Stretch Cling Film Holdings, Inc.*, 831 F.3d at 1362; *Competitive Techs., Inc.*, 185 F. App'x at 965-66. The

Federal Circuit "has repeatedly held that courts may not redraft claims to cure a drafting error made by the patentee, whether to make them operable or to sustain their validity." *Lucent Techs., Inc. v. Gateway, Inc*., 525 F.3d 1200, 1215 (Fed. Cir. 2008). Judicially redrafting claim terms to preserve their validity "would unduly interfere with the function of claims in putting competitors on notice of the scope of the claimed invention." *Hoganas v. Dresser Indus., Inc.*, 9 F.3d 948, 951 (Fed. Cir. 1993). And thus a district court should not hesitate to hold a patent invalid under 35 U.S.C. § 112 where—as here—a fatal flaw appears on the face of the claims.

2. "M^2 represents Mg, or Mg and at least one metal element selected from the group consisting of Ti, Zr, Ge, Nb, Al and Sn, … [and] a content of Mg in the formula (1) is from 0.15% by mole to less than 2% by mole based on an amount of the metal M^1"

Amperex's Proposed Construction	Maxell's Proposed Construction
Indefinite	Plain and ordinary meaning

Further highlighting the problem with the ratios of metals called for in the claimed formulas, the amount of magnesium in claims 1 and 2 of the '019 patent and claim 1 of the '035 patent (all quoted earlier) is internally inconsistent and was previously rejected on that basis by the PTO. In these claims, M^2 can be magnesium alone or in combination with "at least one metal element selected from the group consisting of Ti, Zr, Ge, Nb, Al and Sn." '035 pat. 7:16-27. No range is set. Yet later in the claim, the amount of magnesium is capped by a ratio of "0.15% by mole to less than 2% by mole based on an amount of the metal M^1." *Id*. at 7:48-53. This renders the claim indefinite from a POSITA's perspective. Fuller Dec. ¶¶ 45-46.

Notably, this precise formulation originally appeared in the parent '446 patent application. There, Maxell tried to claim a battery with a positive electrode whose parameters are set forth in Formula (1), "M^2 represents at least one metal element selected from the group consisting of Mg, Ti, Zr, Ge,Nb, Al and Sn," the stoichiometric ratio for M^2 is $0.002 \leq z \leq 0.05$, and "M^2 in the formula (1) comprises Mg and a content of Mg is from 0.15% by mole to less than 2% by mole

based on an amount of the metal element M^1"—just like claim 1 of the '019 patent. But the Examiner rejected the amended claim, explaining:

> A broad range or limitation together with a narrow range or limitation that falls within the broad range or limitation (in the same claim) is considered indefinite, since the resulting claim does not clearly set forth the metes and bounds of the patent protection desired. See MPEP § 2173.05(c). ... In the present instance, claim 9 recites the broad recitation M2 represents at least one metal element selected from the group consisting of Mg, Ti, Zr, Ge, Nb, Al and Sn, and the claim also recites M2 in the formula (1) comprises Mg and a content of Mg is from 0.15% by mole to less than 2% by more based on an amount of the metal element M1, which is the narrower statement of the range/limitation.

Exhibit 9 (non-final rejection) at 2-3 (¶ 5). Rather than contest this rejection, Maxell withdraw the claim. Exhibit 10 (amendment after non-final rejection) at 6. That was the correct outcome because—as the MPEP states and as the Examiner explained—a broad disclosure does not teach the POSITA how to reproduce the invention when the same claim contains both broad and narrow ranges. See generally *In re Ruschig*, 54 C.C.P.A. 1551, 1555-1556 (1967). But then it sought the *exact same claim limitation* in the continuation application that matured into the '019 patent, as well as the separate application that matured into the '035 patent.

The problem the Examiner highlighted during the prosecution of the '446 patent was not cured in the subsequent applications. Claims 1 and 2 of the '019 patent, and claim 1 of the '035 patent, all call broadly for magnesium in any amount as part of M^2, and then limit that amount later in the same claim to a molar ratio in comparison with M^1. This broad range for magnesium coupled in the same claim with a narrower range that falls within the broad range renders the patent claims indefinite—just like the Examiner said and just as MPEP §2173.05(c) demands. Fuller Dec. ¶ 46.

3. "at least 3.5 g/cm^3"

Amperex's Proposed Construction	Maxell's Proposed Construction

Indefinite	Plain and ordinary meaning

Claims 1 and 3 of the '446 patent and claim 1 of the '019 patent also require that the positive electrode mixture layer "has a density of at least 3.5 g/cm^3." Maxell says that the phrase should be given its plain and ordinary meaning. But the plain and ordinary meaning of "at least" has no upper boundary. And while the specification suggests a preferred upper limit of 4.6 g/cm^3, '446 pat. 7:57-67, the claims themselves contain no such limitation—even though the specification *also* indicates that battery reliability decreases as density increases. '446 pat. 2:7-24. A POSITA cannot determine from the patent what the proper range should be and hence "fail[s] to inform, with reasonable certainty, those skilled in the art about the scope of the invention." *Nautilus*, 134 S.Ct. at 2124; see Fuller Dec. ¶¶ 47-48. If a claim includes an open-ended range that includes inoperable densities, it is not enabled under § 112(a).

4. "M^1 represents at least one transition metal element selected from Co, Ni and Mn, ... wherein the content of Co in the transition metal M^1 of the formulae (1) and (2) is from 30% by mole to 100% by mole"

Amperex's Proposed Construction	Maxell's Proposed Construction
Indefinite	Plain and ordinary meaning

Still more indefiniteness problems emerge in the '035 patent, which claims additional elements that do not appear in the '446 or '019 patents. In claim 1 of the '035 patent, M^1 is "selected from Co, Ni and Mn." '035 pat. 6:7-23. This is a *Markush* claim in which M^1 is chosen from the alternatives of Co, Ni, and Mn. "[W]here no generic expression exists by which a group of alternative elements can be claimed, applicants are permitted to recite the elements in the alternative." *Ex parte Markush*, 1925 Dec. Comm'r Pat. 126, 127 (1924). Therefore, the plain and ordinary meaning of this phrase—which Maxell advances as well—is that M^1 can be chosen from "at least one" of cobalt, nickel, *or* manganese. This means, as a matter of simple English, that M^1

can be cobalt, *or* nickel, *or* manganese, or any combination thereof. It can, for example, be entirely nickel or a nickel-manganese alloy. Fuller Dec. ¶ 49.

But then claim 1 goes on to require that "the content of Co" in M^1 "is from 30% by mole to 100% by mole." '035 pat. 6:64-7:3. That is to say, the claim first indicates to a POSITA that cobalt is merely an *optional* ingredient in the claimed lithium-containing transition metal oxide, but then presupposes that cobalt must be between 30% and 100% of M^1. This is an irreconcilable contradiction: if M^1 must contain 30%-100% cobalt, then it cannot be entirely nickel or manganese, despite the claim saying plainly that M^1 can be entirely nickel or manganese. Even multiple cobalt-containing alloys that are manifestly within the phrase "selected from Co, Ni and Mn"—for example, 20% Co, 40% Ni, and 40% Mn—are excluded by the later limitation that "the content of Co" in M^1 "is from 30% by mole to 100% by mole." Faced with these contradictions, a person of ordinary skill cannot determine the parameters of M^1. Fuller Dec. ¶¶ 50-51.

A patentee has an affirmative duty to state claims that are understandable to a person of ordinary skill in the art. *Berhkeimer v. HP Inc.*, 881 F.3d 1360, `363 (Fed. Cir. 2018) (claims "must inform those skilled in the art about the scope of the invention with reasonable certainty") (internal quotations omitted). When a patentee fails in the basic task of explaining what is claimed, the Court should properly conclude that the claims are invalid under Section 112. *Halliburton Energy Servs., Inc. v. M-I LLC*, 514 F.3d 1244, 1249 (Fed. Cir. 2008). The fatal inconsistency in how to interpret the amount of cobalt in M^1 renders claim 1 of the '035 patent invalid.

C. The '251 Patent: Indefinite Terms

The '251 patent describes elements of the separator that divides a Li-ion battery's cathode and anode, and ensures that the battery does not overheat. Two key phrases from claim 1 of the '251 patent are indefinite, highlighting yet again Maxell's difficulty in drafting claim terms that evade prior art and yet also define the metes and bounds of the claimed invention.

1. "the shutdown layer has a thickness A (μm) of 5 to 30, the heat-resistant layer has a thickness B (μm) of 1 to 10, a sum of A and B is 6 to 23, and a ratio A/B is ½ to 4"

Amperex's Proposed Construction	Maxell's Proposed Construction
Indefinite	Plain and ordinary meaning

The shutdown and heat-resistant layers of a Li-ion battery together ensure that the battery does not overheat. At the same time, the thickness of the layers is important because (as the '446 patent explains), "in applications for a mobile communication device such as a portable computer and a personal digital assistant, the battery is required to be made smaller and to trim-weight. Under the current circumstances, however, the system of the battery is not easily made compact or lightweight." '446 pat. 1:16-20. So it is logical for Maxell to have defined the thicknesses of the shutdown and heat-resistant layers. The problem is, taking Maxell at its word and construing the plain language of the terms, `251 patent claim 1 makes no sense. Fuller Dec. ¶ 53.

Claim 1 says that the claimed invention must include both "the heat-resistant layer and the shutdown layer," which "are integrated into a multilayer structure." '251 pat. 4:27-34. The description of the layers first states that the thickness of the shutdown layer is between 5-30 μm and the thickness of the heat-resistant layer is between 1-10 μm. *Id*. at 9:49-60. But it then says that the thickness of the two layers together is between 6-23 μm. *Id*. at 9:33-44. This stipulation creates a host of insoluble problems. Fuller Dec. ¶ 54.

While the claim says that the shutdown layer is between 5-30 μm, that cannot be true if the thickness of the shutdown layer *and the heat-resistant layer* cannot exceed 23 μm. As a question of basic math, the shutdown layer can never be thicker than 23 μm—which renders the statement in the claim that "the shutdown layer has a thickness A (μm) of 5 to 30" internally inconsistent and logically impossible. Fuller Dec. ¶ 55. Because the patent requires both a shutdown layer and a heat-resistant layer, if the heat-resistant layer has a minimum thickness of 1 μm the shutdown layer

can be no thicker than 22 μm in order to satisfy the limitation that the combined layers be no more than 23 μm thick. And if the heat resistant layer extends to its maximum thickness of 10 μm, the shutdown layer can be no thicker than 13 μm. *Id.* ¶ 56. Where a patent's claims are internally inconsistent, the claim is invalid for indefiniteness. *See*, *e.g.*, *Multilayer Stretch Cling Film Holdings, Inc.*, 831 F.3d at 1362; *Trs. of Columbia Univ.*, 811 F.3d at 1366-67; *Allen Eng'g Corp.*, 299 F.3d at 1349; *Competitive Techs., Inc.*, 185 F. App'x at 965-66.

The fourth limitation—that the ratio of A/B is "1/2 to 4"—amplifies the problem. The interplay of the shutdown and heat-resistant layers (A and B) can be expressed in four equations, each of which comes directly from the words of the claim:

$5 \leq A \leq 30$ (1)
$1 \leq B \leq 10$ (2)
$6 \leq (A + B) \leq 23$ (3)
$½ \leq A/B \leq 4$ (4)

Id. ¶ 57. As a question of algebra, these four equations are cannot be reconciled. See *Fargo Elecs. Inc. v. Iris, Ltd.*, 287 F. App'x 96, 100 (Fed. Cir. 2008) ("the claim is invalid for indefiniteness because it is insolubly ambiguous and not amenable to construction.") (cleaned up). Solving equations (3) and (4), we obtain $2 \leq A \leq 18.4$, and $1.2 \leq B \leq 15.3$, which conflicts with (1) and (2), respectively. No one can make these four equations line up – they are simply wrong as a matter of math. *Id.* ¶ 58. This is ample reason to hold that the patent claim is invalid. *See*, *e.g.*, *Multilayer Stretch Cling Film Holdings, Inc.*, 831 F.3d at 1362; *Competitive Techs., Inc.*, 185 F. App'x at 965-66. A court will find a claim indefinite "where a person of ordinary skill in the art could not determine the bounds of the claims, i.e., the claims were insolubly ambiguous." *Halliburton*, 514 F.3d at 1249. That is exactly what a POSITA would conclude here. Fuller Dec. ¶ 59.

And these equations, moreover, were the lynchpin of patentability. The thickness limitations were added to the '251 patent in order to overcome a final rejection based on a prior

art reference that claimed a heat-resistant layer of 1-16 µm and a combined thickness of the heat-resistant and shutdown layers of 5-35 µm. Ex. 11 (final rejection) at 3-5. Faced with this rejection, Maxell amended its claims to set forth the ratios claimed in the '251 patent:

> Nakura et al. US '631 discloses that the heat-resistant porous film has a thickness of 1 to 16 µm and the total thickness of the heat-resistant porous film and the shutdown layer is 5 to 35 µm. However, Nakura et al. US '631 does *not* disclose the following combination of the thickness A (µm) of the shutdown layer and the thickness B (µm) of the heat-resistant layer. Thus, claim 1 *cannot* be obvious from Nakura et al. US '631.
>
> A: 5 to 30,
> B: 1 to 10,
> A + B: 6 to 23,
> A/B: ½ to 4

Exhibit 12 (remarks made in an amendment) at 4-5 (emphasis added). The problem is, those four combinations are internally inconsistent and cannot be reconciled. Thus, while they were the basis for patentability, they also render the patent invalid.

2. "a particle size of 0.2 µm or less ... a particle size of 2 µm or more"

Amperex's Proposed Construction	Maxell's Proposed Construction
Indefinite	Plain and ordinary meaning

A last point concerning the problems with the `251 patent. With respect to the heat-resistant fine particles in the claimed invention, Maxell only specifies that some portion of them have a "a particle size of 0.2 µm or less," while another portion has "a particle size of 2 µm or more." But these particles are not undifferentiated spheres. They are, instead, three-dimensional objects of differing dimensions. In order to specify the dimensions of the heat-resistant particles, Maxell needed to define their parameters in all three dimensions (x, y, and z), rather than generically referring to "particle size." This is best illustrated by an industry reference guide:

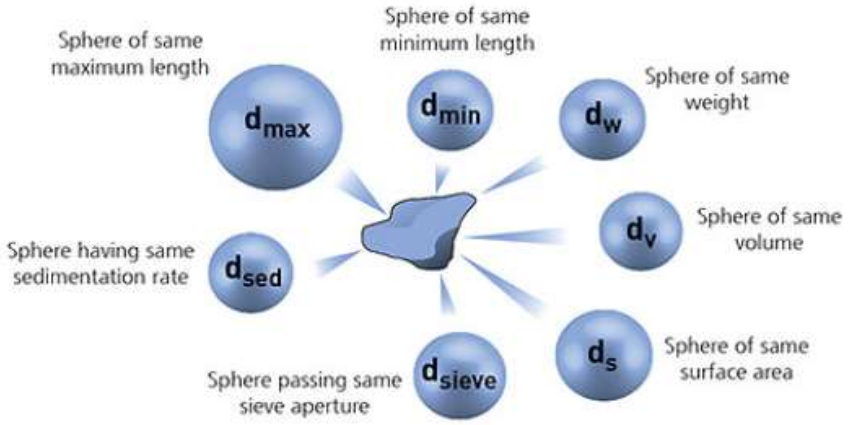

Exhibit 15 (Malvern guide) at 3.

Where there are multiple interpretations of a phrase such as "0.2 µm or less" or "2 µm or more," the patentee must "must disclose a single known approach or establish that, where multiple known approaches exist, a person having ordinary skill in the art would know which approach to select." *Dow Chemical Co. v. Nova Chemicals Corp (Canada)*, 803 F.3d 620, 630 (Fed.Cir. 2015). But nothing in the `251 patent specification indicates how the heat-resistant particles are to be measured. In *Teva Pharmaceuticals USA, Inc. v. Sandoz, Inc.*, the Federal Circuit rejected as indefinite claims with the phrase "molecular weight" because that term could refer to peak average molecular weight, number average molecular weight, or weight average molecular weight—each of which would require a different calculation and lead to "a different result for a given polymer sample." 789 F.3d 1335, 1338 (Fed.Cir. 2015); *Amgen v. Hoechst*, 314 F.3d 1313 (Fed. Cir. 2003) (holding claims indefinite because "two uEPO preparations produced form the same batch of starting materials could nevertheless have different glycosylation patterns"). The same is true here. Because "particle size" could mean diameter at largest point, diameter at smallest point, or average length/width/height, the claim does not set forth the metes and bounds of the invention and hence is indefinite.

IV. CONCLUSION

The Court should construe the following claims terms in the following manner:

Term	Patents	Construction
positive electrode mixture layer	'446 pat cl. 1, 3 '019 pat. cl. 1 '035 pat. cl. 1	A mixture of at least two lithium containing-transition metal oxides formed on one or both sides of an electrode current collector
the positive electrode contains, as [an] active material[s], at least two lithium-containing transition metal oxides having different average particle sizes	'446 pat. cl. 1 '019 pat. cl. 1 '035 pat. cl. 1	The active material of the positive electrode is a mixture formed from two or more lithium-containing transition metal oxides, at least two of the transition metal oxides having different average particle sizes
different compositions of elements / is different from	'446 pat. cl. 1-3 '019 pat. cl. 3-4	The first and second lithium-containing transition metal oxides do not share all of the same chemical elements
a compound having at least two nitrile groups	'446 pat. cl. 1, 3 '019 pat. cl. 1 '035 pat. cl. 1	A nitrile compound that is 1% or less by total weight of the electrolyte
$0.97 \leq x < 1.02$, $0.8 \leq y < 1.02$, $0.002 \leq z \leq 0.05$, and $0 \leq v \leq 0.05$ / $0.97 \leq a < 1.02$, $0.8 \leq b < 1.02$, $0 \leq c \leq 0.02$, and $0 \leq d \leq 0.02$	'446 pat. cl. 1-4 '019 pat. cl. 1-2 '035 pat. cl. 1	Indefinite
M^2 represents Mg, or Mg and at least one metal element selected from the group consisting of Ti, Zr, Ge, Nb, Al and Sn, … [and] a content of Mg in the formula (1) is from 0.15% by mole to less than 2% by mole based on an amount of the metal M^1	'019 pat. cl. 1-2 '035 pat. cl. 1	Indefinite
at least 3.5 g/cm^3	'446 pat. cl. 1, 3 '019 pat. cl. 1	Indefinite
M^1 represents at least one transition metal element selected from Co, Ni and Mn, ... wherein the content of Co in the transition metal M^1 of the formulae (1) and (2) is from 30% by mole to 100% by mole	'035 pat. cl. 1	Indefinite
the shutdown layer has a thickness A (μm) of 5 to 30, the heat-resistant layer has a thickness B (μm) of 1 to 10, a sum of A and B is 6 to 23, and a ratio A/B is ½ to 4	'251 pat. cl. 1	Indefinite
a particle size of 0.2 μm or less ... a particle size of 2 μm or more	`251 pat. cl. 1	Indefinite

Dated: December 22, 2021 Respectfully submitted,

By: */s/ James DeCarlo*

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CERTIFICATE OF SERVICE

Pursuant to the Federal Rules of Civil Procedure and Local Rule CV-5, I hereby certify that all counsel of record who are deemed to have consented to electronic service are being served with a copy of the foregoing document via the Court's CM/ECF system on December 22, 2021.

/s/ James DeCarlo
James DeCarlo